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## **Child social exclusion: an updated index from the 2006 Census**

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## **Abstract**

Much research about child poverty and disadvantage provides national estimates of child wellbeing, due to the ready availability of microdata at the national level. However, an increasing body of evidence suggests that there can be major differences in well-being between children living in different geographic areas. In addition, much recent debate has focussed on moving beyond income poverty to broader measures of social exclusion. This article describes the development of a composite index of child social exclusion risk for Australian small areas, using recently available 2006 Australian Bureau of Statistics Census data, and building on earlier work based on 2001 Census data. Variables included in the index are based on characteristics of children's parents, families and households, and include data about parental partnership status, employment and volunteerism, family educational attainment and occupation, household income, housing, transport and internet connection. Results show that there are pronounced spatial differences in the risk of child social exclusion, with areas of high social exclusion risk common in Australia's rural and regional balance, and in clusters of outer areas in most of Australia's capital cities.

## **Author note**

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The findings in this paper must not be interpreted as New South Wales, Victorian, Queensland, Australian Capital Territory or ABS policy views or endorsements regarding methodology or results. In addition, the child social exclusion index is the subject of ongoing research development. The use of different spatial divisions, the further development of methodology, and/or the introduction of additional variables could potentially change the results presented in this paper.

# 1 Introduction

Many recent studies of poverty among children and families in Australia have tended to be based on income, often concentrating on changes in the level of *national* income poverty over time (see, for example, Bradbury 2003; Harding and Szukalska 2000; Harding, Lloyd and Greenwell 2001; Saunders and Bradbury, 2006; Saunders et al 2008). A limited number of Australian studies have examined the *dynamics* of income-based child poverty (Abello and Harding 2006; Headey et al 2005), and some have included additional indicators of disadvantage, such as subjective deprivation (for example, Marks 2007). There has been strong emphasis in recent policy and research in Europe on social exclusion (Klasen, 1998), and enormous recent policy interest in social inclusion in Australia since the election of the new Labor government. However, relatively few Australian studies have as yet adopted this broader definition of disadvantage to look specifically at children (see Saunders and Naidoo 2008 for recent Australian work in this area) and, apart from our earlier work (Daly et al 2007), none have analysed child social exclusion at a small area level.

The multidimensional nature of child disadvantage has been discussed by a number of authors in an Australian context, in relation to the causes and correlates of income poverty (see, for example, Bradbury, 2003), and the negative effects of child disadvantage throughout the lifecourse are widely acknowledged (Saunders et al 2007). The need to incorporate wider dimensions of disadvantage has become increasingly accepted – and the concept of social exclusion has become one widely recognised framework for understanding, measuring and addressing poverty and disadvantage at this multidimensional level. In particular, recent work by the Social Policy Research Centre (SPRC) has used community surveys and focus groups to develop a more nuanced understanding of what poverty, deprivation and social exclusion mean for Australians – both those with low income and those from the wider community (Saunders et al 2007) – and to develop a set of indicators related to these concepts. The SPRC survey results, based on adult responses about children, have also been used to develop nine indicators of social exclusion for Australian children.<sup>1</sup> The authors estimate that one in six children (about 800,000 children) live

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<sup>1</sup> The nine indicators were – no week's holiday away from home each year, children do not participate in school activities and outings, no hobby or leisure activity for children, no medical treatment if needed, no access to a local doctor or hospital, no access to a bulk-billing doctor, does not have \$500 in emergency savings, could not raise \$2,000 in a week in an emergency and lives in a jobless household.

in households experiencing social exclusion, defined here as experiencing four of the nine indicators listed in the footnote below (Saunders and Naidoo 2008).

There is a very substantial body of international literature relating to the definition and measurement of social exclusion and related concepts (reviewed in Daly, 2006). There is no single definition of social exclusion, but we are adopting here the following definition used by the British Social Exclusion Unit:

‘Social exclusion happens when people or places suffer from a series of problems such as unemployment, discrimination, poor skills, low incomes, poor housing, high crime, ill health and family breakdown. When such problems combine they can create a vicious cycle.’ (SEU, Office of the Deputy Prime Minister,)

There has been limited empirical work using the concept of social exclusion in Australia. The earlier work on which the current study builds used nine variables from the 2001 Census to develop a small area indicator of child social exclusion (Daly et al 2007). In addition to the recent work from the Social Policy Research Centre described above, Saunders (2003) used data from the 1998/99 Household Expenditure Survey (HES) to make some preliminary calculations of the level of social exclusion among households in Australia – and subsequently extended this work to compare outcomes in Australia with those in Britain (Saunders and Adelman 2005). They found that poverty was higher in Britain than in Australia, but that levels of material deprivation and social exclusion were higher in Australia.

Bray (2001) also used data from the HES 1998/99 to look at the incidence of financial hardship in Australia. He concluded that some financial deprivation was common among Australian households but a relatively small proportion of households, 3.1 per cent, faced multiple hardships (defined as having two or more hardship responses: being unable to afford heating or meals, or pawning and selling possessions, or asking for assistance from community organisations). He argued that multiple hardships were particularly important for children under 15 years. The Australian Bureau of Statistics is increasingly collecting and reporting on data which reflects concerns with measures of well-being and disadvantage that go beyond traditional economic measures (see, for example, ABS 2006a, b).

There have been a range of studies of disadvantaged children in Australia and the impact of poverty on indicators including their education and health, and the social and economic implications of poverty (See the Commonwealth of Australia Senate Community Affairs Reference Committee (2004) for a survey). These studies are often specific to particular fields and have not been conducted within the broad framework of social exclusion established in the literature. However, a small number of studies have been located within a broader multidimensional perspective, including work by Daly and Smith (2005) which presents indicators of risk of social exclusion for Indigenous children. Based on data from the 2001 census, they found that Australian Indigenous children were more likely than their non-Indigenous

counterparts to live in lone parent families or with relatives other than their biological parents, and in households with low incomes in which the adults were less likely to be employed. The households were more reliant on welfare and their parents had lower levels of educational attainment than among other Australians. Recent work by Scutella and Smyth (2005) also presents national indicators of child well-being across a number of dimensions, using the capabilities framework initially developed by Amartya Sen.

The above studies, however, lack a spatial dimension. Regional differences in disadvantage, how these develop, and what can be done to overcome them, have become an increasingly important part of research and policy in recent years. There is considerable international literature about the effects of neighbourhood on both children and adults (see Bradshaw et al 2004; Durlauf 2001). In an Australian context, Jensen and Seltzer (2000) examined neighbourhood effects on educational outcomes and found that the neighbourhood unemployment rate, income and education and occupational mix influenced decisions about continuing in post-secondary education.

Hunter and Gregory used data from the 1976 and 1991 population censuses to show that income and employment in the poorest Census Collection Districts declined over this period (Gregory and Hunter 2001; Hunter 1995; Hunter 2003). Hunter (2003) also found evidence of increasing differentiation between neighbourhoods over time from 1980/81 to 1990/91 in Australia, Canada and the US. Another study covering the later period between 1996 and 2001 found that higher increases in gross household income had been experienced by the more affluent half of postcodes (Harding et al, 2004).

These and a range of other studies have provided ample evidence that the geography of disadvantage is pronounced and may even be becoming greater in Australia (Biddle et al 2002; Bray 2003; Lloyd et al 2000). Important here has been the seminal work by Vinson (2001, 2004, 2007), who used the postcode as the unit of analysis and, using indicators spanning a broad range of dimensions such as education, health, income, unemployment and crime, argued that a small number of postcode areas contain significant concentrations of negative indicators.

The Australian Bureau of Statistics (2003) has for many years facilitated spatial analysis by constructing socio-economic indexes for small areas from the Census data – with their Socio-Economic Indexes for Areas (SEIFA indexes) being very widely used, for example, in analysis of the relationships between socio-economic status and service usage (see, for example, Glover et al 1999). However, the ABS SEIFA indexes are not specifically focussed on children – so, for example, an area may have a low SEIFA score because it is largely populated by older Australians on low incomes rather than because it contains disadvantaged children.

Overall, therefore, Australia has until very recently lacked a small area measure of child disadvantage, including one embracing a broader set of indicators than family income alone. For planners and policy makers requiring data about geographic patterns of disadvantage among children and the most effective placement of child-related services, this has been a serious flaw. To fill this gap in the literature, the current authors developed an index of child social exclusion for Australia's small areas, — while also highlighting a possible method for using Census data for policy makers within other countries who seek to answer the same questions about child disadvantage and service delivery (Daly et al 2007, 2008). This paper reports our latest research, updating the 2001 index and incorporating newly available 2006 Census variables.

## **2 Data and Method**

This project updates similar work undertaken by NATSEM which used the 2001 census data. The release last year of 2006 Census data has allowed us to produce an updated index, and also to analyse the geographical distribution of the characteristics that make up the index with the latest available data. In addition, the 2006 census has incorporated several new variables relevant to the measurement of child social exclusion which were not available in previous censuses. It is important to note that the results presented in this paper cannot be directly compared to previously published results based on the 2001 data. Variables included in the index have changed, as have SLA boundaries, and some aspects of our methodology.<sup>2</sup>

### **2.1 Data source and spatial unit**

This project uses data from the Australian 2006 Census of Population and Housing. This is a census of all people in Australia, collecting information on personal, household and family characteristics. It is conducted by the Australian Bureau of Statistics (ABS) once every five years. The census is the only source of data available for the whole of Australia which provides adequate information about indicators of social exclusion at a *small area level*. However, using the census creates numerous challenges for researchers, including important limitations in terms of the level of detail and coverage of issues available through this source.

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<sup>2</sup> An analysis comparing the 2001 and 2006 Child Social Exclusion Index results will be presented at an international conference in August (McNamara et al, 2008). The 2006 results in this paper have been adjusted to make them comparable with the earlier year (e.g. measures have been taken to adjust for changing statistical local area boundaries).



First, some aspects of social exclusion, such as health, are not covered at all by the census, and so cannot be captured within our social exclusion index.<sup>3</sup> Second, some concepts are covered at a lower level of detail than would be ideal. For example, while some indicators of education are available through the census (highest educational achievement of child's family), other variables which might capture more detailed aspects of the child's educational experience (literacy and numeracy, for example) are not available.

We chose Statistical Local Areas (SLAs) as our base spatial unit for this study. SLAs are part of the ABS Australian Standard Geographic Classification (ASGC), so data for them can easily be extracted from the 2006 census. The 1426 SLAs which were part of the ASGC in 2006 were used for this analysis because of problems with the ABS confidentialising small cell counts in tables for smaller areas (such as Census Collection Districts), and because SLAs cover the whole of Australia (as opposed to Local Government Areas which do not cover areas with no local government) and cover contiguous areas (unlike some postcodes). So the SLA is the smallest unit in the ASGC which does not present problems with confidentiality and that covers the whole of Australia without being non-contiguous.

The SLA does, however, present two key problems for studies such as ours. The first is that the populations covered by each SLA can vary greatly in size. The second is known as the 'modifiable areal unit' problem. Large SLAs are more likely to cover heterogeneous populations, so that smaller pockets of disadvantage within the SLA may be 'washed out' in the results by their more affluent neighbours. This is particularly a problem within the Australian Capital Territory and Brisbane, where the SLAs are comparatively small and their populations reasonably homogeneous. We attempted to overcome potential problems with the variation in population (and within-area heterogeneity) through two techniques. First, we aggregated up SLAs in Brisbane and the ACT (the two locations with the largest concentrations of very small SLAs) to larger areas, so that their populations and relative heterogeneity would more closely match those in SLAs across the remainder of Australia, using a methodology developed and tested by Baum et al (2005).<sup>4</sup> Thus, in Brisbane, we

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<sup>3</sup> The 2006 census for the first time has included questions about disability, focusing on the need for assistance with activities of daily living. While much valuable information about physical disability can be gained from this data, it does not attempt to capture broader concepts of health, and we have decided not to include this data in our index.

<sup>4</sup> Alternative methods for addressing the modifiable areal unit problem could include disaggregating (or splitting up) SLAs in other capital cities, rather than aggregating up those in Brisbane and Canberra. However, this would require complex decisions about how to construct smaller areas with social boundaries that the SLA divisions in Brisbane and Canberra (which align to suburbs) inherently incorporate.

aggregated SLAs up to Local Council Electoral Wards, and in the ACT, we aggregated up to Statistical Subdivisions. Second, we present all our analysis as quintiles *weighted by the child population* in each area, so that the uneven distribution of populations between SLAs and between states is controlled for.

It should be noted that, by aggregating up small areas to larger ones, details about pockets of disadvantage within these larger areas may be lost. For example, in the ACT, other research conducted at a higher level of spatial disaggregation shows variations in the degree of disadvantage across small areas that do not appear with the larger spatial units used in this study are used (see, for example, Cassells et al 2007).

While the possible smoothing of within-area differences is a particular problem for larger spatial units, geographically based research such as that presented here does not pick up disadvantage even in smaller spatial units if it occurs among small proportions of individuals or households (sometimes those with particular demographic characteristics, for instance, Indigenous persons – see Kennedy and Firman (2004)) within areas. Thus results from spatially-oriented research should always be used along with knowledge gained from population-based studies which may focus on disadvantage among particular population groups, rather than on geographic differences.

Children are defined in this study as all dependent children aged less than 16 years on census night. Only those children living in their usual residence were included in our study, as our variables capture the characteristics of children's families and households, and it was important that these characteristics were those of the situations in which they usually lived, and not those in which they might have been temporarily resident on census night. We have created three separate indexes – one for children 0 – 4 years, one for children 5 – 15 years, and one for all dependent children aged 0 – 15 years.

## **2.2 Definition and measurement issues**

In trying to define child social exclusion, we were fundamentally limited by the somewhat restricted list of variables collected in the census – and we focus in this study on capturing the characteristics of children's parents, families, households and dwellings. When constructing potential indicators of child social exclusion, we drew on international research that has identified four dimensions of social exclusion (see

Burchardt, Le Grand and Piachaud 2002).<sup>5</sup> The first is consumption, where individuals do not have the capacity to purchase goods and services. This is partly captured within our study through household income. Tenancy in public housing also acts as a proxy for low income. This is not a perfect measure of capacity to purchase goods and services, since some people with low income may have high wealth, so their potential consumption is higher than their income might suggest. However, generally people with low income will also have a limited capacity to purchase goods and services.

The second dimension is production, where individuals are unable to find employment. This is captured in our analysis through parental labour force status and occupation.

The third is involvement in local and national politics and organisations. This was difficult to capture given the limited set of variables we had available to us, but education may be a partial proxy for this involvement. Research in the US suggests that those who invest in human capital also invest in social capital (see Brown and Ferris 2004; Glaeser, Laibson and Sacerdote 2002). In particular, Glaeser et al (2002) found membership in groups was positively associated with educational attainment. Also, a new 2006 Census variable, which captures volunteer effort in the twelve months prior to the census, also partially captures involvement in organisations – and we have used this to measure whether or not children’s parents were involved in volunteer work. The fourth is social interaction and family support. These are also difficult to accurately capture with census data, but are proxied in our study through housing tenure, home internet connection, family type, parental volunteer work and motor vehicle availability.

All the variables we have are proxies for social exclusion dimensions. The 2006 census gives excellent regional data, but at the cost of detail. As a result, we have had to fit the framework around the data we have available. While we refer throughout the paper to the index as a measure of child social exclusion, the limitations inherent in the data on which the index is based should be kept in mind when interpreting the results. It should also be noted that the individual characteristics that have been combined in the index do not by themselves measure social exclusion but are merely risk factors which, when taken as a whole, can be used to capture the concept of social exclusion. It should also be emphasised that our social exclusion measure is an

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<sup>5</sup> While these dimensions are not specifically related to children, they do cover aspects of social exclusion common to both adults and children. More child-specific definitions of social exclusion (see, for example, Adelman and Middleton, 2003; Saunders and Naidoo, 2008), while incorporating many of the same concepts as the ones suggested by Burchardt et al, also include examples that are more closely child-related, such as participation in social activities and access to children’s services and other specific measures difficult to capture with census data.

area-based measure, which is used to summarise the general risk of social exclusion faced by all children living within that area. Obviously, even in an area with a particularly high risk of social exclusion, some children living in that small area will come from advantaged families and not face these high risks (and vice versa).

Finally, the index results presented in this paper result from combining the variables we have described above. The inclusion of different or additional variables could potentially change the geographic distribution of child social exclusion risk presented here. For example, the Australian Capital Territory's (ACT) relatively high rates of internet connection and low proportions of blue collar workers will be contributing to the results shown for the ACT, and the inclusion of additional or alternative measures of disadvantage in the index might result in a different spatial picture of child social exclusion risk within the ACT emerging.

## 2.3 Limitations of income data

A number of issues related to the quality of income data available on the 2006 census need to be noted in relation to our child social exclusion indicator. Income is only available on the census in ranges of gross income, with people who did not respond to the income question classified separately as "not stated". As a result, the best income measure that we could derive was equivalent *gross* family income (rather than the *disposable* family income measure traditionally used by poverty researchers). Where a family had any person in it with a "not stated" income, the whole family was considered as having a "not stated" family income. Valid gross family incomes were then equivalised by the ABS using the modified OECD equivalence scale (see Greenwell et al 2001, for further information about equivalence scales). The first adult was given a weight of 1, each additional person aged 15 years or over was given a weight of 0.5 and children aged under 15 were given a weight of 0.3. Income quintiles were then calculated from these equivalised gross family incomes.<sup>6</sup>

## 2.4 Social exclusion measures

The indicators of social exclusion chosen for use in this study are shown in Table 1. As noted in the table, for some variables, the highest value for the family was taken.

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<sup>6</sup> The income quintiles were calculated by the ABS for all Australian families (including both single person families and those without children), but after removing families with at least one person having a "not stated" income. This means that they are calculated for the whole Australian population, with the bottom quintile representing the bottom 20 per cent of all Australian families and singles with valid income data.

This was because having someone in the family with better circumstances might reduce the child's risk of social exclusion. For example, the presence in the family of an older sibling with post-school qualifications, even if the child's parent may not have such qualifications, creates the possibility of providing a child with additional assistance with school work, and an educational role model, both of which may promote the child's own chances of staying in school, and pursuing post-school studies. For other variables (for example, labour force status and volunteer work), only the status of the parents was considered.

For all variables, the "not stated" classification was identified separately. Where a child's family (or parents depending on the variable) had any person with a "not stated" response on a variable, that child was removed from the analysis of that variable only. The total number of children affected by this varies by variable and SLA but, on average across Australia, for each variable between 1 per cent and 5 per cent of children are in families with "not stated" classifications on variables other than income. The income variable has the highest rate of "not stated" responses, at almost 12 per cent.

In order to calculate the index, all variables were converted to proportions using the total child population with valid data for that variable in that SLA as the denominator. So, for example, the variable measuring children living in households with no motor vehicle was calculated for inclusion in the index by dividing the number of children in households with no motor vehicle in each SLA by the total number of children with a valid response on the motor vehicle census question in that SLA.

**Table 1 List of social exclusion variables used**

<b>Variable in Census</b>	<b>Social Exclusion Measure Developed</b>
<i>Family Type</i>	Proportion of children aged 0 – 15 in single parent family
<i>Education in family</i>	Proportion of children aged 0 – 15 with no-one in the family having completed Year 12
<i>Occupation in family</i>	Proportion of children aged 0 – 15 with highest occupation in family blue collar worker
<i>Housing tenure</i>	Proportion of children aged 0 – 15 in public housing
<i>Labour force status of parents</i>	Proportion of children aged 0 – 15 in family where no parent working
<i>Internet connection</i>	Proportion of children aged 0 – 15 living in dwellings with no internet connection
<i>Motor Vehicle</i>	Proportion of children aged 0 – 15 in household with no motor vehicle
<i>Volunteering</i>	Proportion of children aged 0 – 15 in family where no parent did voluntary work over the past 12 months
<i>Income</i>	Proportion of children aged 0 – 15 in household with income in bottom quintile of equivalent gross household income for all households in Australia

Note: Occupation proportions are calculated using only those families in which at least one person was working. The public housing definition used includes community housing.

Data source: ABS Census of Population and Housing 2006

## 2.5 Removing questionable SLAs

To improve the accuracy of our estimates, the final step before creating the index was to remove any SLAs that had low cell counts or had a very high non-response rate in the census. Low cell counts mean that even a very small change in the data can mean a large percentage change (so one extra child at risk of social exclusion may represent a 33 per cent increase if there are only 3 children in the SLA). To deal with the issue of low cell counts, we excluded from the analysis SLAs with fewer than 30 children in either the 0-4 or 5-15 age group. This cut-off was based on the total child population in the SLA, not the number of children at risk of a particular aspect of social exclusion. So, for example, there may be only 5 children with both parents not working and on a low income in a particular SLA but, as long as the total number of children in that SLA is greater than 30, we include that SLA in the analysis.

High non-response for a particular variable means we do not have a reliable estimate of the value for that variable in that SLA. Any SLA with an 80 per cent or higher non-response rate for any variable included in the social exclusion index was removed from the analysis.

There were a total of 73 SLAs excluded due to low child population, another 3 SLAs excluded due to high non-response, and 9 that had both low population and high non-response. This left a total of 1052 small areas for use in our index creation (with those SLAs in the ACT and Brisbane having been aggregated up to larger areas, as described above). Many of those SLAs which were excluded from our analysis were in the remote areas of northern and central Australia. The exclusion of a reasonably large number of very remote SLAs in a number of states and territories means that many remote Indigenous communities are not included in our analysis of social exclusion. In essence, despite the high levels of disadvantage undoubtedly experienced by many Indigenous children, the small numbers living in remote Indigenous communities, allied with high rates of non-completion or partial completion of the Census questionnaire, means that an SLA-based Census index such as that we have created here is not an appropriate way to measure disadvantage among Indigenous children – and thus that other methods and data sources must be found to address this specific issue (Kennedy and Firman 2004). Despite these exclusions forced by deficiencies in the coverage of the Census data or by small size, it must be emphasised that less than .01 per cent of all Australian children live in the 85 excluded SLAs.

## **2.6 Statistical analysis**

Debates about the best indicators of social exclusion (for both children and adults) abound (see, for example, Atkinson et al 2002; Moore 1997), including the relative merits of composite measures and specific indicators. The use of a composite measure has the advantage of summarising a range of specific indicators and being easier to communicate to the wider public through a 'headline measure' (Micklewright 2001; Barnes 2001). A composite index facilitates comparisons between countries or regions that might perform quite differently on each component of the index. It can also be used to highlight individuals at risk of facing particular disadvantages based on earlier evidence. One drawback of a composite index is that, by summarising a number of components, it might obscure significant results – especially if there are substantial differences in the level of performance on each of the components. A further disadvantage of a composite index is that the final result will reflect the choice of inputs and the method of construction, which are by necessity arbitrary (Micklewright 2001). On balance there are arguments for making both the final composite index and the component variables available, and this is the approach we have taken in this study.

The method we used to summarise the chosen variables into a single measure of child social exclusion was principal components analysis, which has been used in Australia and overseas to create summary indexes from a number of correlated variables (see ABS 2003; Salmond and Crampton 2002). Principal components analysis is a data summary technique. It transforms a set of correlated data (in this case, the set of variables we are using that serve as proxies for different aspects of social exclusion) into a smaller set of uncorrelated components that capture most of the variation of the original set of variables (Dunteman 1989). The aim of the method is to maximise the correlation between the components and the original variables. While the procedure produces several new principal component variables, the first principal component explains the largest amount of the variation in the original variables, and can be used to capture the underlying meaning of the original set of variables. This first principal component thus becomes the index — as is standard practice when creating summary indexes. The ABS SEIFA indexes, and the NZ Indexes of Deprivation both use the first component only (see ABS 2003; Salmond and Crampton 2002). Further components can give some additional insights into other aspects of social exclusion but, if the aim of the research is to produce a summary measure of social exclusion, then it is appropriate to use the first component as the index.

Once the first principal components analysis was run, variable loadings were examined so that any variables with low loadings could be excluded from the index. The loading is simply the correlation between the component and the variable. If this is low, then the component is not highly correlated with the variable, and the variable can be removed without affecting the component's explanatory power much. No variables were removed in this case, as all loadings were relatively high. The final list of variables, loadings and eigenvalues for the child social exclusion index (CSE Index) are shown in Table 2. The eigenvalue shows the amount of total variance in the original variables accounted for by the final index (or first principal component). It is measured in terms of units of variance. It can then be expressed as a percent by dividing the eigenvalue by the number of variables used in the principal components analysis and multiplying by 100. Here, as shown in Table 2, this calculation produces a value of 65.8 per cent for the index for children aged 0 – 15 years, indicating that 65.8 per cent of the variance in the original variables is explained by the index. This figure is similar (66.0% and 63.7% respectively) for the index for children aged 0 – 4 years and 5 – 15 years. This is a good result, and compares well with the ABS SEIFA indexes for 2006, which explain between 39 per cent and 52 per cent of the variation in the original data (ABS 2008).

The highest loadings were on the education, internet connection and income variables. Education and income are mentioned in the literature as significant drivers of social exclusion (see for example ABS 2003; Marks et al 2000), so this result was



expected. The high loading on the internet connection variable suggests that it may be acting as a proxy for other social exclusion variables.

**Table 2 Table of variables, loadings and eigenvalues for the Social Exclusion index**

	Loadings		
	All children 0- 15 years	Children 0 to 4 years	Children 5-15 years
Single parent	0.73	0.80	0.67
Education	0.90	0.93	0.86
Occupation	0.71	0.63	0.72
Tenure type	0.85	0.85	0.86
Labour force status	0.83	0.80	0.79
Internet connection	0.95	0.95	0.93
Motor vehicle	0.85	0.85	0.86
Volunteer work	0.46	0.46	0.48
Income	0.90	0.90	0.91
% variance explained	65.8	66.0	63.7

Data source: ABS Census of Population and Housing 2006; authors calculations

As noted earlier, we used our raw data from the index to create child population weighted geographic quintiles of social exclusion risk, in order to control for the effects of different population sizes within SLAs. To match with common practice when using income quintiles to measure relative economic wellbeing (where the bottom quintile is the quintile that is relatively worst off), we ranked all SLAs by their social exclusion index value, and then divided them into child-weighted quintiles of social exclusion, with the lowest quintile indicating the highest risk of social exclusion, and higher quintiles representing lower social exclusion. Our bottom social exclusion quintile thus represents the 20 per cent of children facing the highest risks of being socially excluded.<sup>7</sup>

<sup>7</sup> Because each SLA was assigned a single value of the social exclusion index, when constructing the child-weighted social exclusion quintiles we had to allocate all the

As the loadings suggest, there is a substantial degree of overlap between the indexes we create for the three age groups of children, and this is supported when we correlate the child population weighted quintiles produced by the three indexes. These results are shown in Table 3, and indicate that the index for children 5 to 15 years is very similar to that for all children 0 to 15. The index for younger children does diverge somewhat more from the overall index, with a correlation between the two measures of .94 – and with the correlation between the two separate age indexes being slightly lower again, at .89. In most of this paper, however, we will focus on index results for the 0 – 15 years age group.

**Table 3 Correlations between CSE indexes for children aged 0 to 15, 0 to 4 and 5 to 15, 2006**

	Children 0-15 quintiles	Children 0-4 quintiles	Children 5-15 quintiles
Children 0-15 quintiles	1.00	0.94	0.97
Children 0-4 quintiles	0.94	1.00	0.89
Children 5-15 quintiles	0.97	0.89	1.00

*Note: Correlation coefficients are Spearman coefficients.*

*Data source: ABS Census of Population and Housing 2006; authors calculations*

### 3 Results

As noted earlier, the results presented below should be interpreted in the context of the particular methodology adopted in this study. The choice of spatial unit, the choice and construction of index variables, and the statistical analysis techniques used all affect the apparent geographic distribution of child social exclusion risk. The index we present here is the subject of ongoing development, and changes in spatial unit selection, variables and methodology could potentially change the results presented in this paper. Particular issues which were raised in the methodology section include the variations in both population size and likely population heterogeneity for SLAs, the aggregation of SLAs in some areas to larger spatial units,

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children in one SLA to a single quintile so that, on occasion, very marginally more or less than 20 per cent of children were allocated to each social exclusion quintile (because we could not split an SLA into pieces to create exactly the right number of children). This was still considered a better outcome than not weighting the quintiles of social exclusion by the child population.

the limitations of the variables available in the Census to measure child social exclusion, and the inability of geographically-based analysis to identify pockets of disadvantage among smaller population groups within SLAs .

### **3.1 Where do Australian children at risk of social exclusion live?**

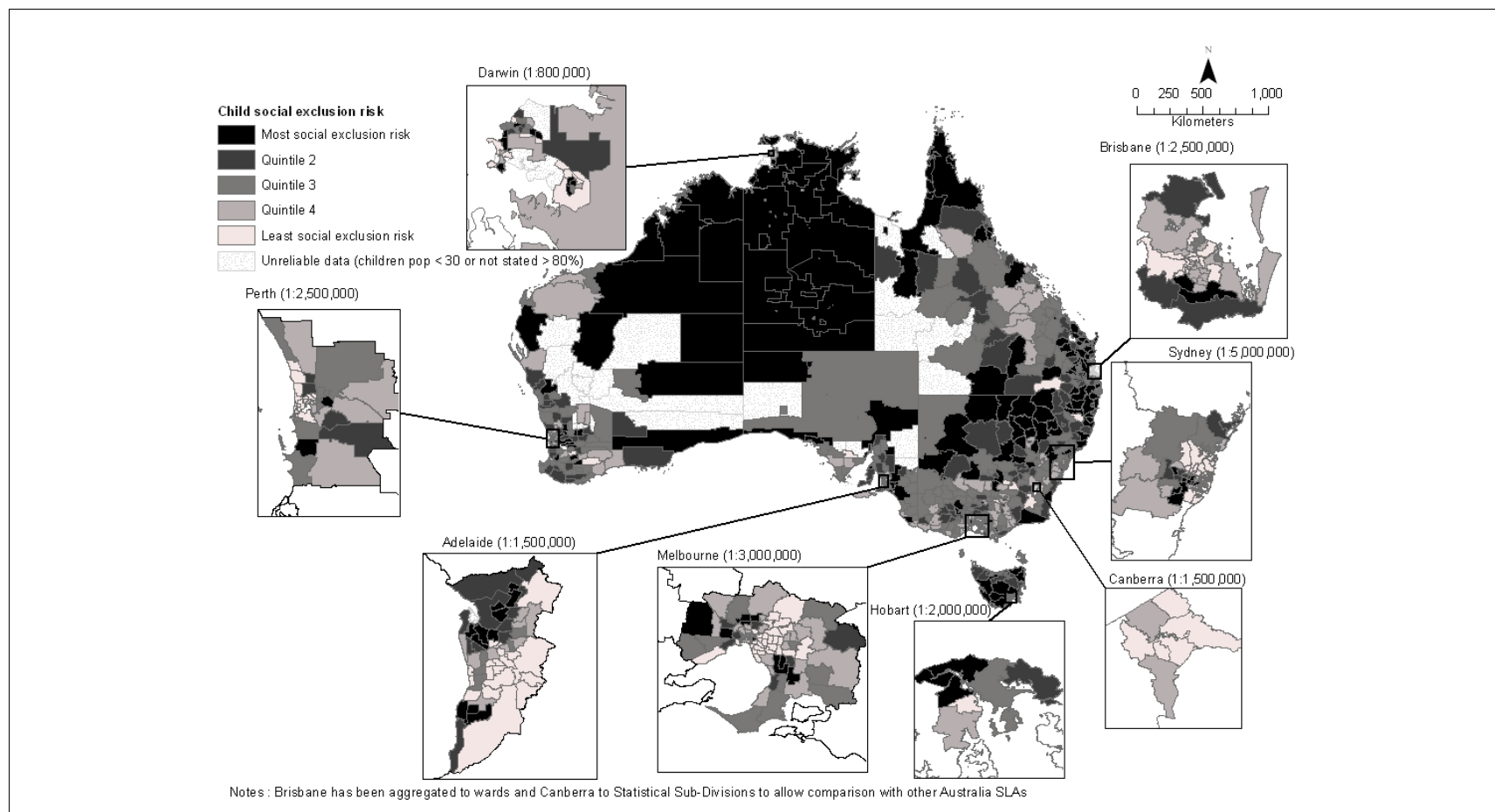
Figure 1 shows the distribution of child social exclusion by small area, for the whole of Australia and for each of the state and territory capital cities for all children aged 0 – 15 years. Figures 2 and 3 show the same distribution for children aged 0 – 4 years (Figure 2) and 5 – 15 years (Figure 3). The darkest colour on the maps represents the areas with the highest risk of social exclusion (the bottom quintile) with the lightest colour representing areas with the lowest risk of child social exclusion. Areas that are stippled on the map are those for which data was not reliable enough to be included in our calculations (as explained in the methodology section).

From the national map for 0 – 15 year olds, some spatial patterns can be observed. First, areas with high child social exclusion are somewhat more likely to be in rural than urban areas, with relatively large numbers of small areas away from the populous and urbanised coastal areas falling into the bottom one or two social exclusion quintiles. Some of the inland areas in Western Australia and Queensland with lower child social exclusion risk (the lighter areas on the map) incorporate mining areas, which, in comparison to other remote Australian regions, may have fewer children living in them, and may not be as disadvantaged in socioeconomic terms as non-mining remote areas. When viewing the map, it is important to note that some of the rural small areas which fall into the lowest quintile of child social exclusion risk also have quite low populations – so that while they represent large geographical areas, they represent much smaller proportions of the total child population than some of the geographically smaller urban and coastal small areas.

The snapshots of the capital cities in Figure 1 demonstrate substantial variation within and between these cities in terms of child social exclusion risk. All cities except Canberra have some areas which fall into the bottom two quintiles of child social exclusion risk, generally in suburbs towards the outer edges of these cities. For example clusters of areas in south-west Sydney, the northern and southern suburbs of Adelaide, and the far west and south-east of Melbourne all show high concentrations of child social exclusion risk. These types of differences within cities, and the presence, particularly in outlying suburbs, of a reasonably large number of small areas in the bottom quintile of the CSE Index, make it clear that, while social exclusion risk is lower for capital city than other children, risks are also substantial for children in some capital city areas.

Similar geographical patterns are evident when the indexes for the two different age groups of children are mapped. Figure 3 (5 – 15 year olds) is very similar to Figure 1 (as expected from the correlations between the indexes shown in Table 3), but when Figures 2 and 3 (0 -4 year olds) are compared, some of the differences between these indexes are evident. For example, rural Queensland small areas are somewhat more likely to fall into the lowest quintile for the 5-15 years index than for the index for younger children. Further, Hobart has some additional areas of moderate to high social exclusion risk for younger compared to older children.

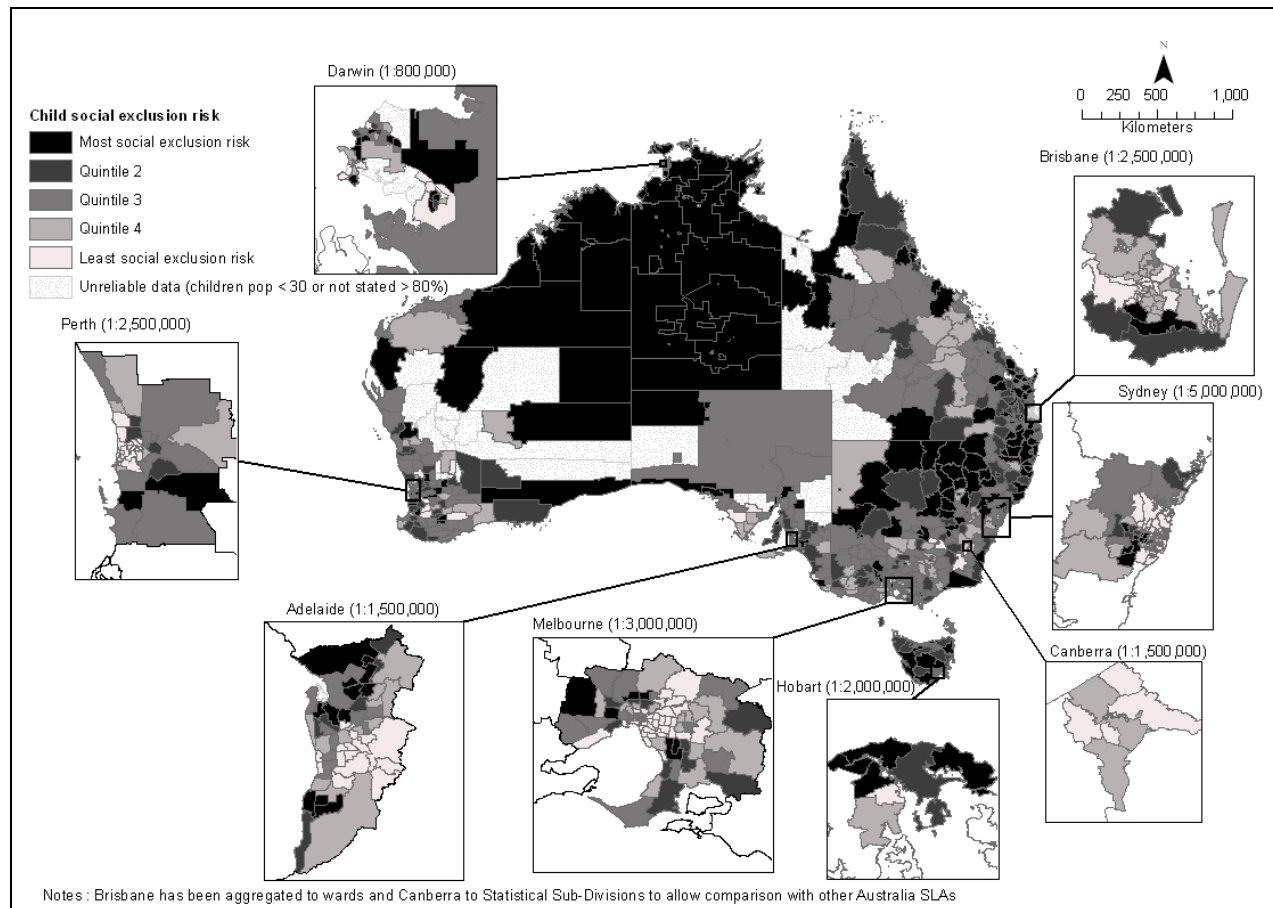
**Figure 1 Statistical local area distribution of child social exclusion risk, all children 0 – 15 years**



*Note:* Quintiles are weighted by child populations.

*Data source:* ABS Census of Population and Housing 2006, authors' calculations.

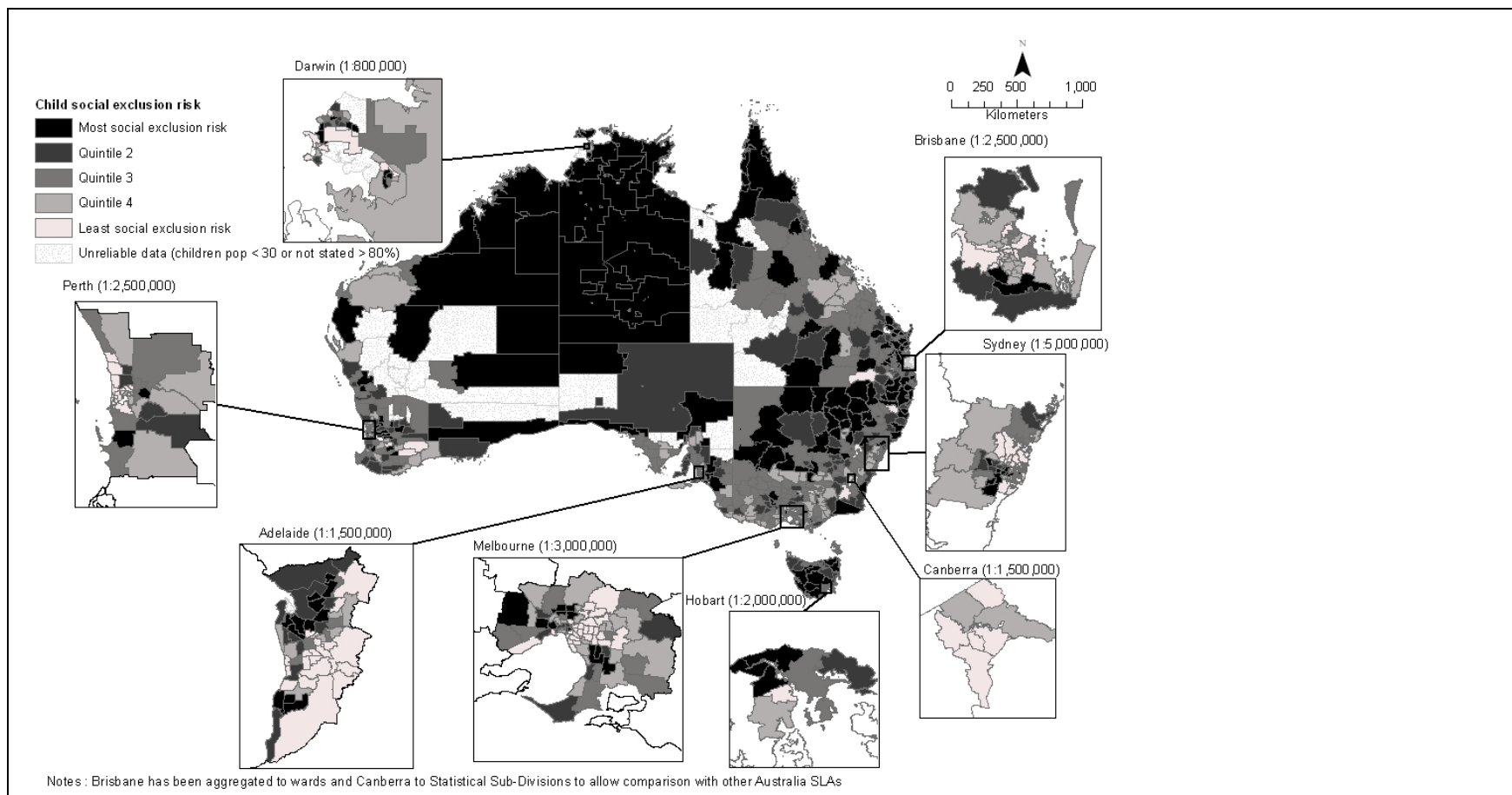
**Figure 2 Statistical local area distribution of child social exclusion risk, children 0 – 4 years**



*Note:* Quintiles are weighted by child populations.

*Data source:* ABS Census of Population and Housing 2006, authors' calculations.

**Figure 3 Statistical local area distribution of child social exclusion risk, children 5-15 years**



*Note:* Quintiles are weighted by child populations..

*Data source:* ABS Census of Population and Housing 2006, authors' calculations.

### 3.2 State and Territory

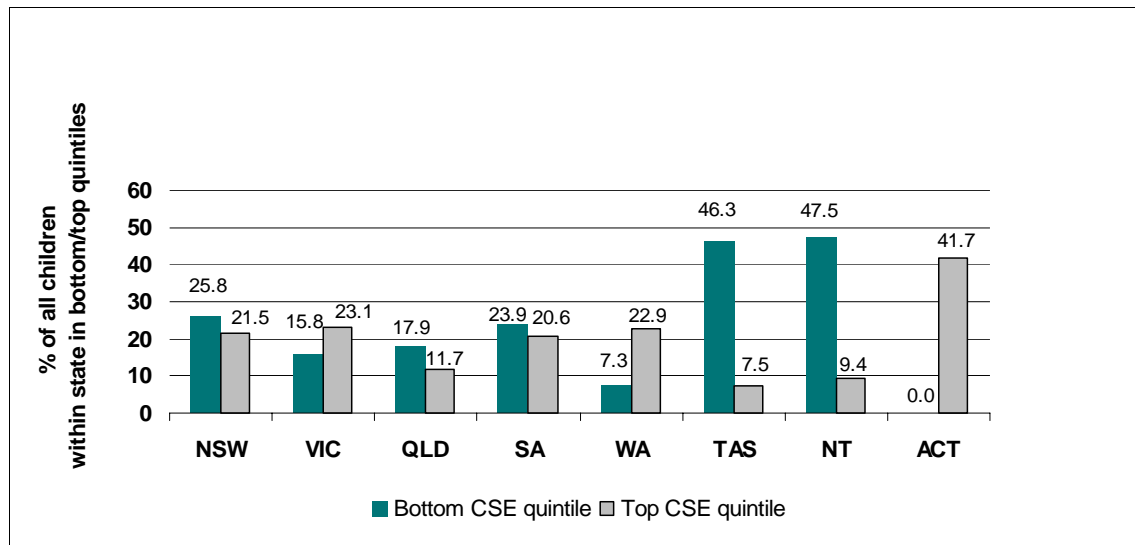
When we examined differences by state further, we found reasonably substantial gaps between states and territories in terms of the percentage of children facing the greatest risk of social exclusion. Figure 4 shows that a relatively high percentage of children aged 0 – 15 in Tasmania and the Northern Territory fall into the bottom Child Social Exclusion (CSE) quintile – 46.3 per cent of all Tasmanian children fall into the lowest national CSE quintile, and 47.5 per cent of all Northern Territory children. In contrast, the ACT, Western Australia and Victoria have relatively low percentages of their child population in the bottom CSE quintile. The Western Australian figure, however, should be interpreted in the light of a number of remote Western Australian SLAs being excluded from our analysis (as shown by the stippled areas on the maps above).

An alternative way of looking at spatial disparities in child social exclusion is to examine the percentage of children in each state and territory in the top CSE quintile – that is, the twenty per cent of children living in the areas *least at risk* of child social exclusion. These results are also included in Figure 4, and show that 41.7 per cent of all those children living in the Australian Capital Territory live in areas that fall into the top CSE quintile, while the top quintile percentage for Queensland is only 11.7 per cent, and even lower for Tasmania and the Northern Territory. The differences between the states and territories are striking, and make it clear that simply taking national averages masks very substantial variation between children living within different areas of Australia. Once again, however, it should be noted that areas that fall into the top quintiles of CSE risk may nevertheless contain children who are disadvantaged, just in smaller proportions than in areas which fall into quintiles of higher risk.

An equally interesting perspective is to show in which state and territory the children facing the greatest risks of social exclusion live (results presented in Figure 5). New South Wales, Tasmania and Northern Territory children are over-represented in the bottom social exclusion quintile – for example, although only 33 per cent of all 0-15 year old children included in our modelling live in New South Wales, children in this state make up 42.3 per cent of all those children in the bottom CSE quintile. Conversely, although just over 24 per cent of all children live in Victoria, only 19.3 per cent of children in the bottom CSE quintile come from Victoria. Substantial differences between states and territories can also be seen at the top end of the quintile distribution, with children in New South Wales, Victoria, Western Australia and the Australian Capital Territory all being over-represented in the top (least risk) child social exclusion quintile.



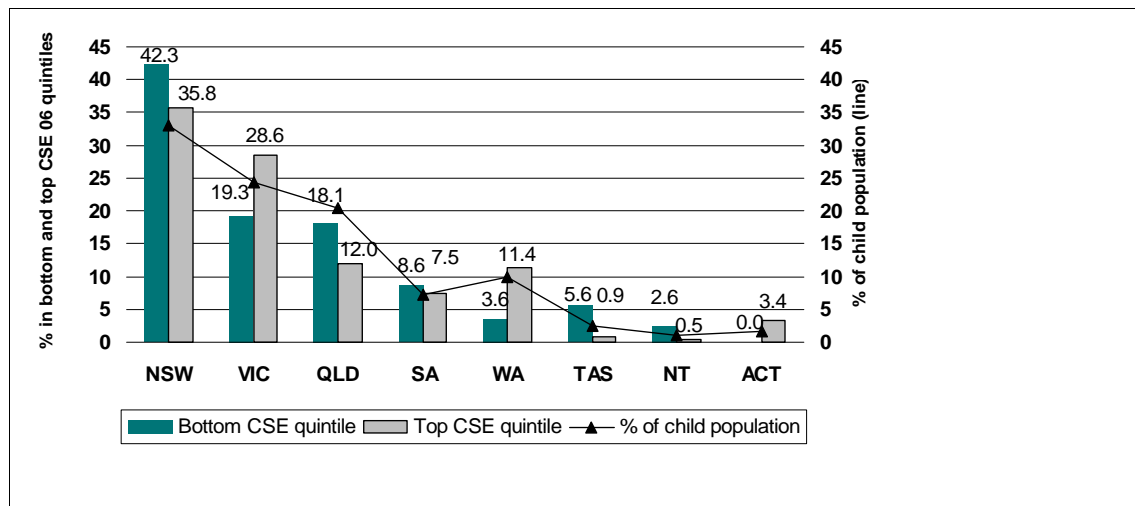
**Figure 4 Percentage of 0 – 15 year old children within each state/territory in bottom and top CSE quintiles, 2006**



Note: The figure shows, for example, that 23.9 per cent of all children living in South Australia are in the bottom national CSE quintile.

Data source: ABS Census of Population and Housing 2006, authors' calculations

**Figure 5 Proportion of all children in bottom and top CSE quintiles and proportion of all 0-15 year old children, by state and territory, 2006**



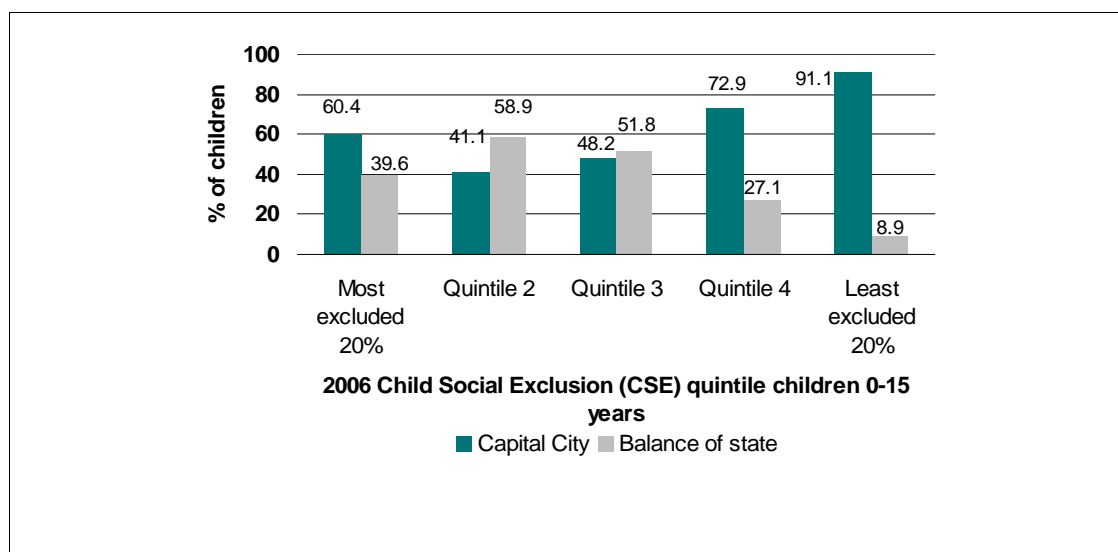
Note: The figure shows, for example, that 8.6 per cent of all of the Australian children in the bottom CSE quintile live in South Australia.

Data source: ABS Census of Population and Housing 2006, authors' calculations.

### 3.3 Capital cities vs the balance

Further investigation into the differing distribution of child social exclusion risk across urban and rural areas reveals, as shown in Figure 6, that 60.4 per cent of all those children in the bottom CSE quintile live in capital cities — while the remaining 39.6 per cent live in rural, regional and non-capital city urban areas. Given that 62.7 per cent of all children 0-15 years of age included in our modelling live in Australia's capital cities, this result suggests that the likelihood of being socially excluded is slightly higher for children living outside the capital cities. Figure 6 also demonstrates that the second CSE quintile shows substantial differences between capital cities and the balance of Australia. For example, only 41.1 per cent of children in the second CSE quintile live in capital cities, with well over half of children in this quintile coming from Australia's rural and regional balance. Even larger differences between capital cities and regional areas are evident at the advantaged end of the social exclusion spectrum, with over 9 in every 10 children in the top CSE quintile living in capital cities.

**Figure 6 Children ranked by CSE quintile, capital cities vs balance, 2006**

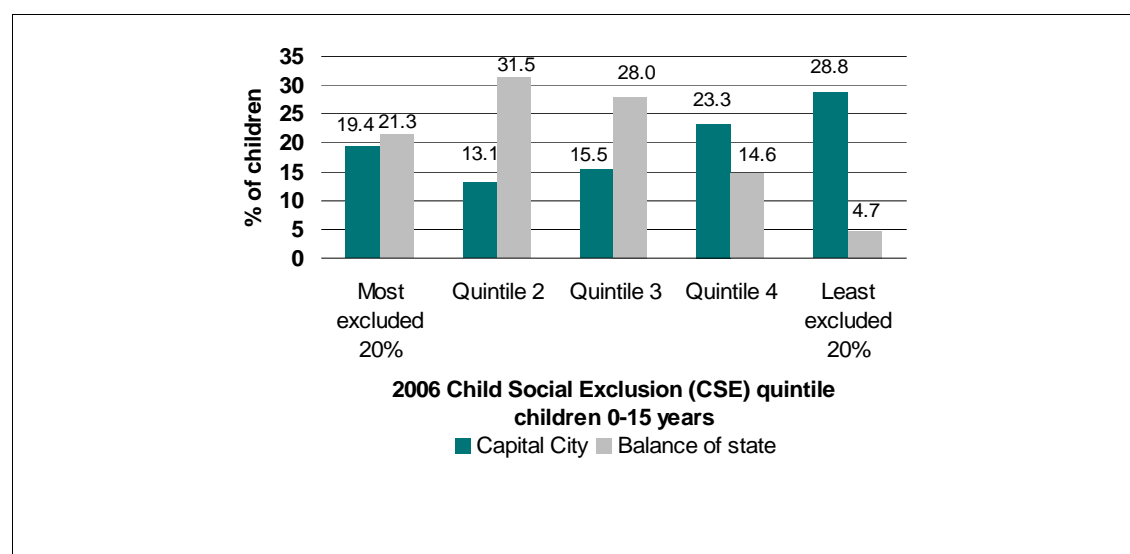


Data source: ABS Census of Population and Housing 2006, authors' calculations.

Differences in child social exclusion risk between capital cities and the balance of Australia are presented in an alternative way in Figure 7, which shows the proportion of children in each CSE quintile in each of the two broad regions. So while Figure 6 showed the distribution of children in capital city and balance of state *within a quintile*, Figure 7 shows the distribution of children over all quintiles by capital city and balance of state. This shows some differences, particularly if we take into account the second as well as bottom quintile of the CSE Index. While the split between capital city and other areas is relatively even for the bottom quintile of risk

(although capital city children show somewhat lower risk than non-capital city children), only 13.1 per cent of children in capital cities fall into the second quintile of social exclusion, while 31.5 per cent of children living in Australia's rural and regional balance fall into this quintile. Very sharp differences are seen in the top quintile, with 28.8 per cent of capital city children falling into the most advantaged quintile, compared with only 4.7 per cent of those children living outside the capitals.

**Figure 7 Proportion of children in CSE quintiles, capital cities vs balance, 2006**



Data source: ABS Census of Population and Housing 2006, authors' calculations.

The proportions of children with specific characteristics associated with social exclusion risk (that is, those factors that make up the composite index) living in capital cities compared with the rest of Australia are presented in Table 4. These results show that the differences in capital city and rural social exclusion risk appear to arise more from some factors than others.

The proportion of children living in single parent families or in families with no motor car, for example, show relatively small differences between capital city and regional areas. Other factors, however, show much more marked differences – in particular, measures of family educational attainment, public housing tenancy and internet connection. The proportion of children living in a family where no family member completed Year 12 is much higher in regional areas than in capital city areas. While 16.5 per cent of children living in capital cities have no family member who has completed Year 12, this proportion rises to just over one-quarter of children in Australia's regional balance. Interestingly, the proportion of children living in a family where no parent has done volunteer work is somewhat lower in non-capital

city than capital city areas – the only one of the variables which make up the composite index to be distributed in this way.

**Table 4 Social exclusion characteristics by capital city/balance of Australia, 2006**

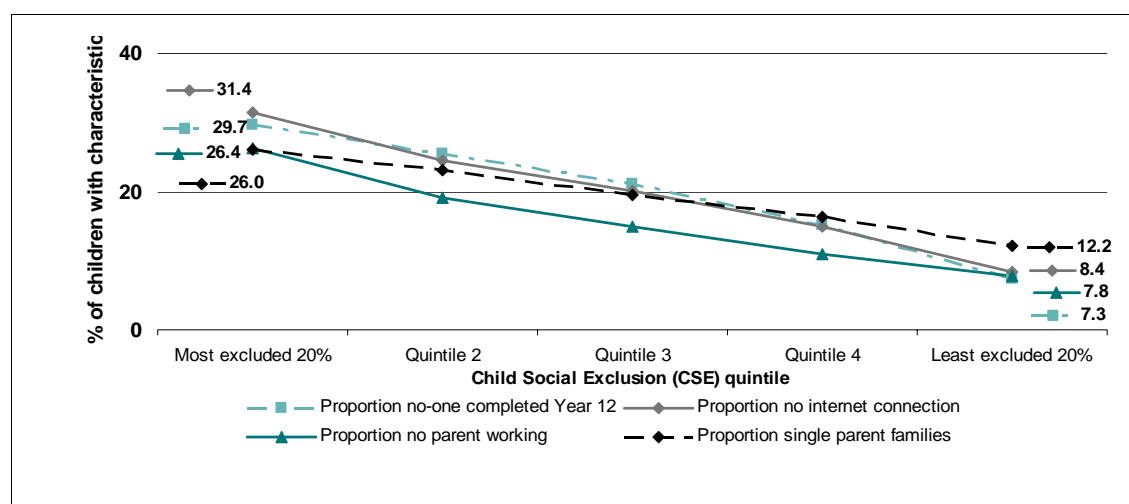
	Capital cities	Balance of Australia	% point difference	% difference
<b>Child and family characteristics</b>	<b>Mean proportion of children</b>			
One parent family	18.2	21.6	3.4	18.4
Not Year 12	16.5	25.3	8.8	53.1
Blue collar	15.8	19.1	3.3	20.6
Rent -public	4.6	7.0	2.4	52.8
Parents not working	14.9	17.6	2.7	18.4
No internet connection	17.5	23.9	6.4	36.6
No motor vehicle	3.7	4.7	1.0	27.0
No parent volunteering	68.3	62.0	-6.3	-9.2
Bottom income quintile	17.1	22.1	5.0	29.4

Note: Occupation proportions are calculated using only those families in which at least one person was working. The public housing definition used includes community housing.

Source: ABS Census of Population and Housing 2006; authors' calculations.

### 3.4 Characteristics by CSE quintile

Figure 8 provides further insight into how selected factors underpinning the principal components analysis vary across CSE quintiles – namely, no one in the family who completed Year 12, no parent working, no internet connection, and single parent status. These results show very substantial differences in disadvantage factors between children living in areas at most and least risk of social exclusion. For example, 29.7 per cent of those children in the bottom CSE quintile live in a family where no one has completed Year 12 schooling and 31.4 per cent live in a household with no internet connection. Shifting to the most advantaged children at the other end of the spectrum, only 7.3 per cent of all those children in the top CSE quintile live in a family where no one has completed Year 12 and only 8.4 per cent live in a household with no internet connection. Similarly, Figure 8 shows that children facing the greatest risks of social exclusion are over three times as likely to live in a family where no parent is working as children living in the top CSE quintile. While differences in the likelihood of living in a single parent family by social exclusion quintile are somewhat less strong than for some other factors, children in the bottom (highest risk) quintile are still well over twice as likely to live with a single parent as children in the top CSE quintile.

**Figure 8 Proportion of children with specified characteristics, by CSE quintile, 2006**

Data source: ABS Census of Population and Housing 2006, authors' calculations.

### 3.5 Portrait of two worlds: highest and lowest risks

It is evident from the previous section that large differences exist across Australia in the risk of child social exclusion. The magnitude of these differences, and the extent to which they cut across many dimensions of children's social and economic environment, is made clearer by looking in detail at the characteristics of those small areas which experience both the highest and the lowest risk of child social exclusion. In Table 5 we present the mean proportion of children with a range of social exclusion risk factors in the 50 SLAs with the highest levels of child social exclusion (according to our CSE Index) compared with these same characteristics in the 50 SLAs with the lowest levels of child social exclusion risk.

Dramatic differences in child well-being indicators exist between the two groups. Over 60 per cent of children in the most at-risk areas come from a family where no-one has completed Year 12, compared with just over 4 per cent of children in the least at-risk areas, and over two-thirds of those children in the most at-risk SLAs live in public housing. A substantial proportion (46.8 per cent) of children in the highest-risk areas live in homes without a car, compared with only 1.3 per cent of children in the lowest-risk areas. Very large differences in income disadvantage also exist. Geographical divides between occupational status, single parent status, joblessness and volunteerism are also strong, but are somewhat less marked for these characteristics.

**Table 5 Comparison between SLAs most and least at risk of child social exclusion, 2006**

	Bottom 50 SLAs	Top 50 SLAs	% point difference	% difference
<i>Child and family characteristics</i>	Mean proportion of children	Mean proportion of children		
One parent family	36.4	10.0	-26.4	-72.6
Not Year 12	60.1	4.3	-55.8	-92.8
Blue collar	25.7	4.9	-20.8	-81.0
Rent -public	70.6	0.7	-69.9	-99.0
Parents not working	39.6	6.6	-33.0	-83.4
No internet connection	78.2	5.5	-72.7	-92.9
No motor vehicle	46.8	1.3	-45.4	-97.1
No parent volunteering	79.4	57.3	-22.0	-27.7
Bottom income quintile	58.6	6.7	-51.9	-88.5

Note: Occupation proportions are calculated using only those families in which at least one person was working. The public housing definition used includes community housing.

Data source: ABS Census of Population and Housing 2006; authors' calculations.

## 4 Conclusions

In recent years researchers in many countries have become accustomed to the ready availability of microdata to answer questions about poverty and disadvantage, helped by initiatives such as the Luxembourg Income Study (Smeeding, 2002) and the Canberra Group (2001). As a result, estimates of poverty and inequality at the national level have become more regular and widely available. However, such microdata are often obtained from national sample surveys in which the geographic location of the respondents has been suppressed to protect privacy and/or the sample size is not sufficient to allow detailed analysis of the geography of disadvantage – resulting in a comparative neglect of the spatial dimensions of inequality. A second issue is that there has been a growing international appreciation that it is important to look beyond income-based measures to broader measures of social exclusion and disadvantage.

This paper addresses both of these dimensions, shedding new light on the geography of child social exclusion in Australia, and updating earlier work based on the 2001 census, by using principal components analysis and the 2006 census data to develop a single summary index of child social exclusion risk for small areas within Australia. The results emphasise the importance of the spatial perspective, which may be masked when only national estimates are produced. The study suggests that the likelihood of being in the bottom Child Social Exclusion (CSE) quintile varies greatly by the state or territory within which children live with, for example, almost one half of children living in Tasmania and the Northern Territory living in areas which fall into the most disadvantaged CSE quintile compared with less than one

quarter of children in South Australia. As noted earlier in the paper, however, areas of low social exclusion risk may still include children living in circumstances of disadvantage, just in relatively low proportions.

Children living outside the capital cities face a slightly higher risk of social exclusion than those living within the capital cities, with some 21 per cent of all children living outside capital cities falling into the bottom CSE quintile compared with around 19 per cent of those inside capital cities. There is also a much bigger differential at the top end of the disadvantage distribution, with over 28 per cent of capital city children falling into the top (least exclusion risk) CSE quintile, compared with less than 5 per cent of children living in Australia's rural and regional balance. These differences between children in Australia's capital cities and in other areas are further demonstrated when individual indicators that make up the composite index are analysed. These show, for example, that non-capital city children are more likely than their capital city counterparts to be living in single parent families, and in households with low income, no internet connection and relatively low educational achievement. Conversely, capital city children are more likely to be living in families where parents are not involved in volunteer work (a proxy measure of social interaction and community involvement that may perhaps somewhat offset some of the other socioeconomic disadvantages experienced by some children in rural and regional communities).

Our spatial analysis also shows that there are great differences between small areas in the family and household characteristics of children living in regions with high levels of social exclusion compared with those living in areas of lower social exclusion. Using our CSE quintiles, bottom quintile children are substantially more likely to live in families where no-one has completed Year 12 and in families where no parent is working than children in other CSE quintiles. Differences such as these are even more marked when only those areas at the extreme ends of the social exclusion distribution are examined.

As noted earlier, the child social exclusion index presented in this paper is the subject of ongoing development, and the results presented in this paper could potentially change as the result of further methodological developments, or the use of different spatial divisions or additional variables. In addition, the spatial results presented in this paper present social exclusion from a geographic perspective, and information provided here should be interpreted in the context of additional population-based studies of disadvantage, which may highlight disadvantage among population sub-groups that cannot be adequately identified in this type of research.

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